Ice, Seals, and Guns: Late 19th-Century Alaska Native Commercial Sealing in Southeast Alaska

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Abstract. Starting in about 1870, indigenous residents of southeast Alaska intensified their traditional hunting of harbor seals (*Phoca vitulina richardii*) in order to produce surpluses of skins and oil for trade with the Alaska Commercial Company. The most important hunting ground was the head of Yakutat Bay, where thousands of seals were taken annually in June and July at the ice floe rookery near Hubbard Glacier and processed on shore at Keik'uliyáa sealing camp. Firearms obtained in trade were essential tools for mass harvesting. A multisource study of Keik'uliyáa and the historical ecology of 19th-century sealing at Yakutat was undertaken during 2011 and 2013 by the Smithsonian Institution in collaboration with the Yakutat Tlingit Tribe, employing oral history, archaeology, archival sources, and photographic documentation from the 1899 Harriman Alaska Expedition. Economic, social, and ecological dimensions of this historical mode of production are examined and compared with both earlier and later eras.

As Western mercantile companies established trade networks across the Arctic and Subarctic regions of North America during the 16th through 19th centuries, indigenous peoples seized the opportunity to produce furs, skins, and oils for world markets in exchange for consumer goods, including metal tools, firearms, clothing, and tobacco (Arendt 2010; Bockstoce 2009; Eccles 1988; Innis 1999; Nassaney 2015; Ray 1984, 1988; Wolf 1982). With few exceptions—most notably the quest for sea otters and fur seals under Russian rule in Alaska—this market response was voluntary (Crowell 1997; Kardulias 1990; Ray and Freeman 1978). Northern peoples intensified hunting and adjusted their seasonal activities and social practices to accommodate the new mode of production. Aided by guns and iron traps, they increased harvests of beaver, marten, foxes, seals, caribou, and other target species to levels exceeding basic needs for subsistence and intertribal trade and in many cases leading to the depletion of animal stocks. Indigenous resource management and conservation practices limited hunting in some but not most situations (Burch 2007, 2012; Fienup-Riordan 1990; Hames 2007; Harkin 2007; Hunn et al. 2003; Krech 1999). From the perspective of historical ecology, northern societies altered their complex relationships with the natural environment and, to a certain degree, the environment itself (Crumley 1994; Rick and Braje 2011).

The present study explores these dynamics through the example of market sealing by the Tlingit-Eyak-Ahtna inhabitants of Yakutat Bay, who after the U.S. purchase of Alaska from Russia in 1867 expanded their traditional hunt for harbor seals (*Phoca vitulina richardii*), also known as hair seals, in order to produce surplus skins and oil for trade with the newly established

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Alaska Commercial Company (ACC). Hunting was conducted primarily at the ice-floe seal rookery near Hubbard Glacier at the head of the fjord, where men in wooden canoes took thousands of seals each summer using rifles and harpoons, and women processed the catch at shoreline camps. Commercial hunting for the ACC was a major source of income for the community, supplemented by sales of beaded sealskin bags and moccasins to traders and early steamship tourists (de Laguna 1972:347–373). Yakutat Bay was the center of a regional sealing industry in southeast Alaska, about which U.S. census enumerator Ivan Petroff (1884:90) wrote "the natives on many of the islands make quite a profitable business of killing hair seals for their hides and the oil rendered from the blubber." Yakutat Bay was, according to George Bird Grinnell in 1899, "perhaps the greatest hair sealing ground on the coast" (Burroughs et al. 1901:161). Underlining its prominence, indigenous hunting parties traveled from Sitka, Juneau, and other locations as distant as northern British Columbia to join Yakutat residents in the annual hunt.

The harbor seal is abundant in the Gulf of Alaska and southern Bering Sea, and its hides, meat, fat, oil, and internal organs were traditionally used by all coastal groups. While commercial hunting, which flourished into the 1960s, has been illegal since passage of the Marine Mammal Protection Act in 1972. Harbor seals are still taken for subsistence in over 60 Alaska Native communities, including Yakutat, and the statewide harvest is about 1,400 animals per year (Wolfe et al. 2009). Historically the harbor seal was less commercially valuable than the northern fur seal (*Callorhinus ursinus*) because it lacks the latter's luxurious pelt, but its hides, along with those of other species of hair seals from Alaska, Canada, and Greenland, were used as a durable commercial leather for knapsacks, trunk covers, and other applications. Oil from the harbor seal's thick blubber layer was sold as a lamp fuel and industrial lubricant into the early 20th century (Clark 1911).

The present discussion is based on historical and archaeological information from the Keik'uliyáa sealing camp at "Indian Camp Creek" near the head of Yakutat Bay (Alaska state site number YAK-00012), which was occupied each June and July for market and subsistence hunting by hundreds of local residents and visitors. Keik'uliyáa (an Eyak place name) is an important cultural heritage site and was investigated in 2011 and 2013 by the Smithsonian Institution's Arctic Studies Center in collaboration with the Yakutat Tlingit Tribe, U.S. Forest Service, and Sealaska Heritage Institute, with funding from the National Science Foundation's Arctic Social Sciences Program (Crowell 2012). Oral information about the camp and seal-hunting practices during the late 19th and early 20th centuries was shared in interviews given by Yakutat elders George Ramos, Elaine Abraham, Lena Farkas, Raymond Sensemeier, Ted Valle, and Bertrand Adams. Documentation and place names pertaining to Keik'uliyáa and other sealing camps were earlier recorded by linguist John Harrington and anthropologist Frederica de Laguna (de Laguna 1972; Harrington 1940; Thornton 2012). The historical record includes observations, photographs, and paintings of Keik'uliyáa camp made by members of the Harriman Alaska Expedition in 1899 (Burroughs et al. 1901); notes published by scientists and other visitors to the region (Abercrombie 1900; Dall 1877; Seton Karr 1887; Tarr and Martin 1912, 1914); and archival records from the ACC's Nuchek post in Prince William Sound, which was the main trading location for Yakutat hunters through about 1885 (ACC 1869–1905; Ketz and Arndt 2010).

Precontact and Russian-Era Sealing at Yakutat Bay

Yakutat Bay (including its inner third, Disenchantment Bay, or Laax̱aayík, [near the glacier]) extends inland some 60 km before doubling back toward the Gulf of Alaska as Russell Fjord (Fig. 1). Peaks of the Chugach-St. Elias Range rise to over 4,500 m at the head of the Yakutat drainage and up to 1,500 m in the immediate vicinity of the bay. The massive Hubbard Glacier, flanked by Turner and Haenke glaciers, flows out of the mountains and reaches tidewater at the head of the fjord, where it discharges large amounts of ice and sediment. Hubbard is one of the few glaciers in the world to be currently advancing, and it periodically blocks off the channel between Yakutat Bay and Russell Fjord (Trabant et al. 2003). Malaspina Glacier—the world's largest piedmont glacier—occupies coastal lowlands between Yakutat and Icy bays. About 3,100 years ago these glaciers expanded and coalesced, filling Yakutat Fjord with an ice mass that bulged out into the Gulf of Alaska (Barclay et al. 2001; Tarr and Martin 1914). Retreat began after AD 1200 during the Medieval Warm Period and continued through the late 19th century, when the glaciers attained approximately their present limits.

Glacial ice floes in Disenchantment Bay provide the platform for a spring harbor seal rookery that is presently utilized by about 2,100 animals (Jansen et al. 2014). Given over a century of intensive hunting and steep ecosystem-driven declines in regional seal populations since the 1970s, numbers would have formerly been much higher (Allen and Angliss 2011; Springer et al. 2007). Female seals gather on the floating ice pack in May and June to give birth to pups, followed by three to six

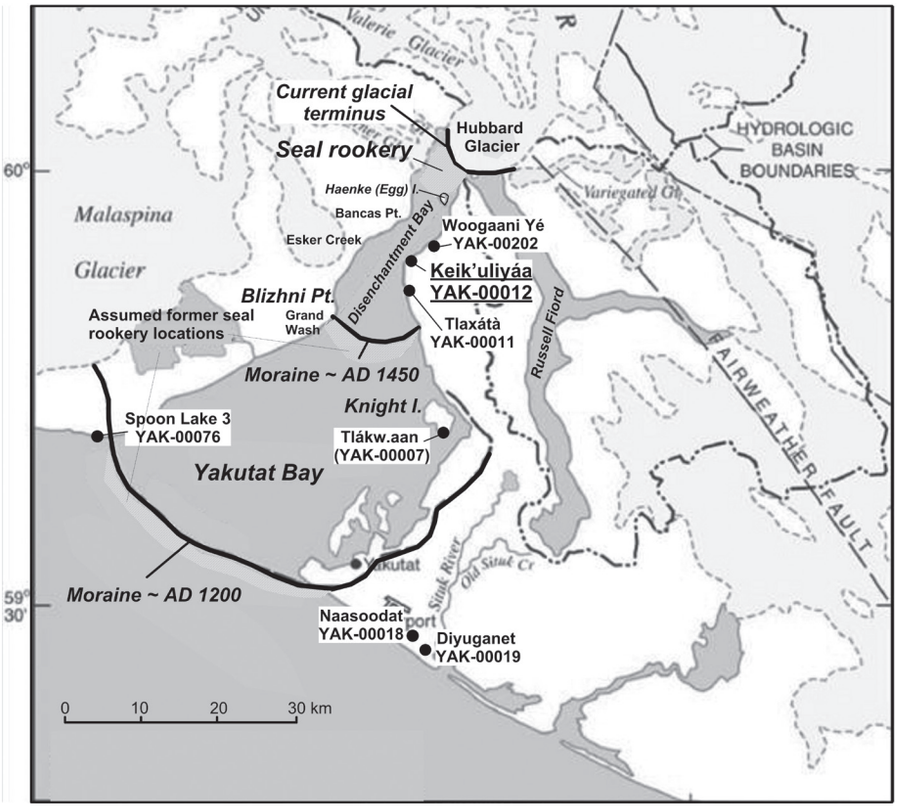

Figure 1. Selected archaeological sites and glacial positions in Yakutat Bay occupied after AD 1200.

weeks of nursing and the arrival of males for the breeding season. This habitat, unlike tidally submerged terrestrial haul-outs, allows the seals and their pups to stay above water at all times to avoid predation by killer whales and sharks. The females do not feed while at the rookery, subsisting instead on the thick blubber layer they have accumulated before giving birth (Jeremiah James, interview 2014). The number of pups in Disenchantment Bay peaks by mid-June, while the overall seal population increases through August, then declines (Jansen et al. 2014). Ice cover is thickest in mid-June at the height of the pupping season then diminishes rapidly, a phenomenon that gave rise to the traditional belief that the seals gather the floes together to block hunters' canoes from entering the rookery until after the pups are born (Maggie Adams in Harrington 1940).

Ice-floe rookeries are present at tidewater glaciers around the Gulf of Alaska, including Icy Bay just to the north of Yakutat (Hoover-Miller 1994; Iverson et al. 2007). The pattern of seasonal harbor seal concentration in floe packs is likely to have extended far into the past and was exploited by coastal hunters at various locations, including Aialik Bay on the Kenai Peninsula (Crowell et al. 2008). Hoonah Tlingit seal hunters exploited the ice-floe rookery in Glacier Bay, although on a smaller scale than at Yakutat (Muir 1879; Wood 1882).

While pre-Neoglacial human habitation of Yakutat Bay is likely, no archaeological evidence from this time period is known to have survived the Hubbard's advance. Yakutat oral traditions and archaeological evidence indicate that the Yakutat foreland was resettled when the ice was still near its full extent, followed by establishment of villages and camps farther up the bay as the ice withdrew (Fig. 1). Eyak clans, remembered in oral tradition as the Laax̱aayík Teik̲weidí and the Hmyeidi, may have been the first to arrive, occupying sites including Diyaguna'et (YAK-00019) in the Lost River/Tawah Creek area just east of modern Yakutat village, where the oldest radiocarbon date was 1110±50 BP (AD 784–987, Beta 31473, charcoal) and nearby Naasoodat, or Shallow Water Town (YAK-00020) with a basal date of 740±80 BP (AD 1218–1285, Beta 33030, charcoal) (Davis 1996; de Laguna 1972). On the Malaspina shore, the Spoon Lake 3 site (YAK-00076) was settled close to the glacial front in about 750±100 BP (AD 1040–1410, Beta 96769, charcoal) (Crowell 2011). Bone preservation at these sites is poor to absent, but stone scrapers, projectile points, and oil lamps

suggest dependence on sea-mammal hunting, probably including exploitation of a harbor seal rookery at the glacier's edge.

Around AD 1500, an Ahtna Raven clan from the middle Copper River—the Gineix K̲wáan, later known as the Kwaashk'i K̲wáan—migrated south to Yakutat, intermarried with Eyak coastal residents, and purchased resource rights to the entire bay with copper brought from their homeland (Cruikshank 2001:382–384; de Laguna 1972:231–247; Harrington 1940; Swanton 1909:347–368). This migration, well documented in oral tradition, is confirmed by archaeological evidence from the first Kwaashk'i K̲wáan winter village, Tlakw.aan (Old Town) on Knight Island (YAK-00007) (Crowell field data 2014; De Laguna et al. 1964). Radiocarbon dates sampled from the Tlakw.aan midden in 2014 are as old as 371±23 BP (AD 1450–1520 and AD 1590–1620, PRI-15-039-8, *Picea* charcoal), with an early 16th-century date as the best estimate of initial occupation (Kovačik and Cummings 2015). At this time, Knight Island had only recently been deglaciated and Hubbard Glacier was seated on its mid-bay moraine near Blizhni Point, providing close access to the ice floe rookery (Fig. 1).

Artifacts from Tlakw.aan include barbed bone harpoon heads, cobble spall scrapers, slate knives, semilunar knives with copper blades, and pecked stone oil lamps, all associated with sea-mammal hunting, processing, and use. Harbor seal is the most abundant mammalian species in the well-preserved faunal assemblage, with harbor porpoise a distant second. The harbor seal remains include large numbers of pups, providing an indication of spring rookery hunting at Hubbard Glacier. While age estimates were not possible for 537 of the 747 total harbor seal specimens, of the remaining 210 there were 22 adults (10.5%), 21 immature (10%), and 167 young-of-the-year or pups (79.5%) (Crowell 2014 field data; Michael Etnier, personal communication, 2015). Kwaashk'i K̲wáan oral tradition from the time of the migration describes hunting at the glacier, the "seals' home" where the animals were plentiful (Swanton 1909:360–361).

In the early to mid-18th century, Tlingit clans including the Kaagwaantaan, L'uknax̲.adí, and Teik̲weidí, moved north from the Alexander Archipelago and Cross Sound to Dry Bay and Yakutat Bay where they intermarried with Eyak and Ahtna residents (de Laguna 1972). About this time, the old village of Tlakw.aan was abandoned and the occupants moved to Naasoodat. Yakutat residents established a summer settlement at "Port Mulgrave" near the mouth of the bay where they traded sea otters with the first English, Russian, and Spanish expeditions to visit Yakutat Bay including Dixon (1787), Colnett (1788), Izmailov and Bocharov (1788), Malaspina (1791), and Vancouver (1794).

As the glacier continued to retreat, the Kwaashk'i K̲wáan and affiliated clans established spring seal-hunting camps at locations north of Knight Island, including Tłaxátà just south of Point Latouche (YAK-00011) where Malaspina reported residents in July 1791, and Keik'uliyáa camp at Indian Camp Creek in Disenchantment Bay. Keik'uliyáa may have been in use by the 1840s, when 100 people were reportedly killed there by a wave generated by the collapse of a hanging glacier (Tarr and Martin 1914:167). At Woogaani Yé (YAK-00202), a Teik̲weidí fort and possible sealing camp was attacked by the L'uknax̲.adí in about 1805, but there is little additional information about this site (de Laguna 1972:67–68). Two more camps on the east side of Disenchantment Bay, at Calahonda Creek and the next unnamed stream valley to the north, are also remembered in oral tradition but do not appear to have been extensively used (de Laguna 1972:68; Thornton 2012:21–22). Several locations on the west side of the bay, including Bancas Point, Esker Creek, and Grand Wash, were reportedly used by hunting parties from other parts of southeast Alaska (George Ramos, interview, 2011), but exact dates and locations are unknown.

Sealing at Keik'uliyáa and other Disenchantment Bay camps prior to the end of Russian colonial rule in 1867 was primarily or perhaps entirely undertaken for local subsistence and trade, since an effective external market had not yet developed. The Russian-American Company (RAC) did not export hair seal products and needed skins (known as *laftaks*) only to cover kayaks employed in its sea otter hunting fleets, which it acquired from villages in the Aleutian Islands, Kodiak Island, and Prince William Sound. The people of Yakutat Bay traded sea otters and other furs at the RAC's Konstantinovsk fort in Prince William Sound, but no seal skins from Yakutat are mentioned in company documents (Ketz and Arndt 1990). Direct RAC trade in Yakutat Bay was very limited, especially after the company's briefly occupied outpost (1796–1805) was destroyed by local residents (de Laguna 1972:73–74).

Yakutat Sealing after 1867

Commodity hunting of harbor seals in southern Alaska was stimulated by the arrival of the ACC, which in 1867 took over fur trade posts formerly operated by the RAC (Lee 1996). These included Konstantinovsk, which was renamed Nuchek. The ACC, which was provisioned by ship from San Francisco, imported a far greater volume and diversity of manufactured goods for Native consumers than the RAC and paid higher prices for furs. Inventories for Nuchek (administratively part of the company's Kodiak District) enumerate thousands of separate items of clothing, beads, food, dry goods,

cookware, hardware, tobacco, toys, musical instruments, firearms, and ammunition, most purchased from San Francisco wholesalers, which were offered to hunters in exchange for furs and skins (ACC 1869–1905; Ketz and Arndt 2010). The store bought pelts of sea otters, river otters, foxes, minks, muskrats, ermines, martens, black bears, and wolverines from Alaska Native hunters, in addition to large quantities of harbor seal hides and oil.

As early as 1873, the Nuchek manager reported that "Kolosh" (Tlingit) people were bringing these products from Yakutat to exchange for guns and other trade goods (Ketz and Arndt 2010:53). An "Indian Ranch" or bunkhouse was built to house trading parties from Yakutat Bay and the Copper River area. Keeping up the bellicose reputation that they had gained in Russian times, Yakutat men would "take possession of the settlement, compelling the Aleuts [Sugpiaq] to take refuge at Port Chalmers, some 20 miles distant, and causing anxiety to the [white] traders" (Abercrombie 1900:395).

Nuchek accounts indicate that from 1872 to 1878 the store shipped at least 4,000 gallons of seal oil and 2,000 seal skins to the Kodiak district office, and this is probably an undercount due to incomplete records. The totals included production from sealing stations in Prince William Sound as well as Yakutat Bay. Yakutat traders may have also traded furs, seal skins, and seal oil at the ACC's briefly occupied post at Cape Martin (closed by 1886) and in Sitka, where there was no ACC store but competing firms had been established. In 1886, the ACC opened a store in Yakutat itself (ACC 1869–1905; de Laguna 1972:353).

Yakutat harbor seal harvests appear to have increased substantially during these years to produce a surplus for trade. Baseline annual production for subsistence alone can be approximated by multiplying the Yakutat population—about 250 people in 1874 (Dall 1877:37), 300 in 1880 (Petroff 1884:92–93) and 300 in 1890 (Skidmore 1893:53)—by an estimate of two seals per person (adults and children), or approximately 52 kilos/114 pounds of meat and fat (edible yield estimate from Ashley 2002), which would account for 500 to 600 seals per year. Supporting this assumption, Elaine Abraham recalled that when she was a girl in the 1930s, her father would take about one dozen seals per year to feed a family of six (Elaine Abraham, interview 2011). For comparison with more recent decades, the approximately 400 Alaska Native residents of Yakutat harvested an estimated 248 seals in 1992 and 135 in 2008, indicating an ongoing decline in per capita consumption (Wolfe and Mishler 1994; Wolfe et al. 2009). Modern hunters take seals at many locations around the bay and at the Situk River, with relatively little emphasis on rookery hunting.

There are only two incidental reports of the actual numbers of seals killed in Disenchantment Bay during the height of the 19th-century commercial boom, but these suggest a multifold increase over the number needed for food alone. Yakutat hunters were said to have killed 1,500 seals during just three days in July 1886 (Seton Karr 1887:71) and members of the Harriman expedition estimated that as many as 1,000 scraped and stretched skins were present in Keik'uliyáa camp on June 21, 1899, less than halfway through the hunting season (Burroughs 1901:165). The camp at that time was occupied by about 300 people, including Yakutat residents and visitors from Sitka and Juneau. Based on these observations, an average of 50 seals per day at Keik'uliyáa is suggested, amounting to 3,000 seals over a two-month hunting season.

Yakutat Bay experienced two large earthquakes accompanied by tidal waves in September 1899, four months after the Harriman visit. The Keik'uliyáa area was seismically uplifted, and when hunters returned they camped along the new shoreline (see archaeological discussion). This location was still apparently being used in 1912 when geologists Tarr and Martin marked it as "Indian Sealing Camp" on their map of Disenchantment Bay (Tarr and Martin 1912:plate XIV). Elders today remember that some families hunted and camped there until the 1930s, but primarily for subsistence (Lena Farkas and Elaine Abraham, interviews in 2011 and 2012).

The early 20th-century decline of the camp can be attributed to a slump in the hair seal market. Although over 17,000 skins (various species, including harbor seals) worth about $12,000 were shipped from Alaska in 1906 (U.S. Department of Commerce and Labor 1907:59), by 1914 "they had comparatively little value except as [they are] used by the natives for boots, wearing apparel, and for making souvenirs" (Jones 1914:54). The worldwide market for seal oil collapsed around 1900 as it was replaced by petroleum products.

Intensive seal hunting revived during the bounty era (1927–1972) when game managers for the Territory (and later State) of Alaska declared hair seals to be "pests" that harmed the salmon industry and subsidized their mass killing by paying bounties of $2 to $4 apiece to Alaska Native hunters. From 1927 to 1952, bounty kills averaged over 5,300 animals per year in southeast Alaska and about 7,700 statewide (Paige 1993). Figures specifically for Yakutat have not been obtained. The Department of Fish and Game also undertook a "predator control" program in the 1950s that included dropping depth charges on congregations of seals at river mouths (Kruse and Springer 2007; Paige 1993).

The 1960s saw a new peak in the commercial market for seal hides, adding kills of 40,000

to 60,000 hair seals statewide per year in addition to the bounty numbers, although many animals may have been tallied for both purposes (Kruse and Springer 2007). One white resident of Yakutat reported buying 3,300 harbor seal skins from local hunters in 1964 and selling them for a large profit (de Laguna 1972:373–374). George Ramos of Yakutat recalled that in the mid-1960s he shot 600 harbor seals in one season at Icy Bay for their hides (George Ramos, interview 2011). Keik'uliyáa camp was no longer used during this era, but archaeological remains of a 1960s sealing camp were found at Woogaani Yé (Crowell 2013 field data).

Late 19th-Century Sealing at Keik'uliyáa: Historical Documentation

Each spring, as early as mid-May, but most often about the beginning of June, the entire population of Yakutat would leave the winter village at Port Mulgrave (or after 1893, Khantaak Island) for Disenchantment Bay, traveling in large wooden canoes that carried families and supplies and in hunting canoes that would be used in the ice (Goldschmidt and Haas 1998:47; Johnson 2014:14). Seton Karr reported that Port Mulgrave village was completely deserted in mid-July 1886 because the inhabitants were sealing at the glacier, and that they returned by August 2 that year (Seton Karr 1887:50–51).

The start date for the sealing season was determined by the Kwaashk'i K̲wáan clan leader, who waited for word from a lookout on Haenke (Egg) Island that newborn seals were visible on the ice floes (George Ramos interview 2011). He would then invite affiliated houses of the Teikweidí and L'uknax.adí to join the Kwaashk'i K̲wáan for hunting. One contemporary view is that the clan leader held off hunting until the pups could "fend for themselves" as a conservation measure. De Laguna was given a different reason—that if the hunt began too early the herd would be frightened away by the sound of rifles, but that once pups were born the mothers would remain with them even under hunting pressure (de Laguna 1972:373–376). Newborn harbor seals are able to swim immediately after birth but nurse for up to six weeks before they can feed independently, so most would not have survived on their own if their mothers were killed before late July (Hoover-Miller 1994; Iverson et al. 2007). Oral accounts and faunal remains from the Tlakw.aan site (above) indicate that pups of nursing age (as well as unborn animals) were taken by hunters along with adult seals. Hunting continued until the end of July or beginning of August when the ice floes dwindled

Figure 2. Yakutat men in dugout spruce hunting canoes offshore at Keik'uliyáa sealing camp, June 1899. Harriman Alaska Expedition photograph courtesy of the National Museum of the American Indian (NMAI P10966).

and seal pelts began to lose quality prior to the autumn molt.

Hunters stalked seals amid the floes in two-person dugout canoes (Fig. 2) and used their hands, clad in waterproof seal-gut mittens, to push aside impeding chunks of ice. A special sealing canoe (*goodi.yee*) with an ice bumper in front was used anciently, but by the 19th century the ordinary hunting canoe with inwardly curved bow and stern had been adopted. Before they possessed firearms, hunters used long harpoons armed with barbed bone points to strike and secure seals before pulling them in on the harpoon line and killing them with clubs (de Laguna 1972:373–376; George Ramos and Elaine Abraham, 2011 interviews). Hunters with guns could shoot seals from much farther away and with greater success but still employed harpoons (later, boathooks) to fasten onto dead or wounded animals that were in danger of sinking. Hazards of hunting included shifting currents and winds that could pack ice around a canoe and crush it, rolling icebergs, and waves generated by huge chunks crashing off the 100 m high face of Hubbard Glacier. Hunters watched for strong tidal currents flowing out of Russell Fjord that could split open the ice pack and expose the heart of the seal herd, and when this occurred they made daring runs into the lead between fields of moving ice to reach the animals (George Ramos, interview 2011).

Hunting guns available in Yakutat included flintlock muskets by the 1790s and percussion cap muzzle-loading rifles by the 1840s. Muzzle-loading .44 caliber rifle/12 gauge shotgun combinations were the most common weapon in 1884 (Abercrombie 1900:395) and these "double guns" are listed in Nuchek inventories of the 1880s (ACC

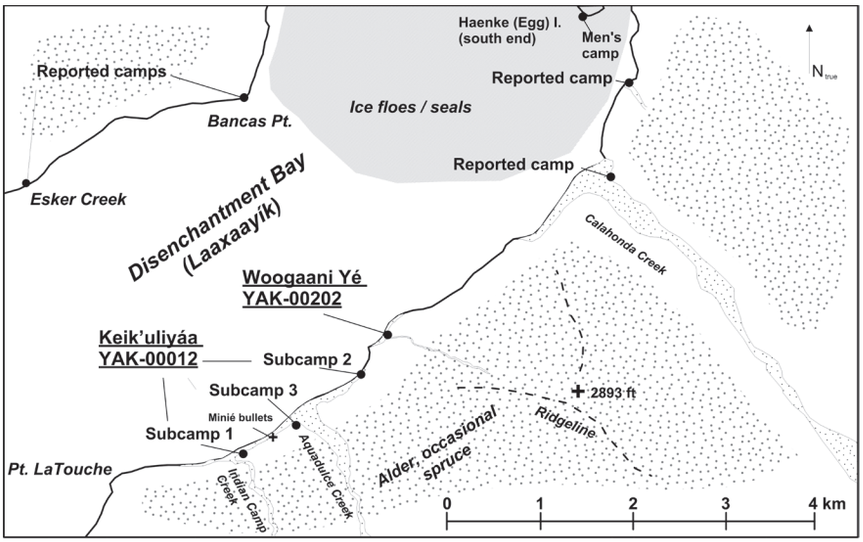

Figure 3. Keik'uliyáa sealing camp and other reported camps and archaeological sites in Disenchantment Bay.

1869–1905). Although sales of breech-loading rifles and shotguns to Alaska Natives were intermittently prohibited (during 1868–1869, 1875–1896, and 1899–1924), these guns were common at Yakutat by the 1890s (Carlisle 1897:873–874; Murton 1965; Porter 1911:779; Strobridge and Noble 1999). The Harriman expedition reported that the "crack of the Winchesters . . . could be heard out among the ice," referring to breech-loading rifles and carbines that were used at that time (Burroughs 1901:60). Firearms, especially these modern guns with magazines and relatively high rates of fire, enabled large numbers of seals to be killed and were essential to production of a market surplus.

Keik'uliyáa was a "family camp" which served as a base for hunting; a residential area for men, women, and children; and a center of seal processing activities. In addition, there were smaller "men's camps" on Haenke (Egg) Island and other forward positions within the ice field where hunters might stay for several days before returning with their catch (George Ramos, interview 2011). Although sealing was far and above the main activity at Keik'uliyáa, other foods were also sought including black bears, seagull eggs (from Heanke Island), wild celery, seaweed, chitons, and mussels. Structures at Keik'uliyáa included canvas wall tents where families slept and pole-framed smokehouses covered with sheets of hemlock or spruce bark (de Laguna 1972:67–68).

In the camp, women skinned seals by the hundreds, flensed blubber from the hides, scraped the skins, and stretched them to dry on wooden frames. John Burroughs wrote that the beach at Keik'uliyáa was "redolent of seal oil. The dead carcasses of the seals lay in rows upon the pebbles in front of the tents and huts. The women and girls were skinning them and cutting out the blubber . . ." (Burroughs et al. 1901:60). They split the meat into strips and hung it along with seal flippers in the smokehouses to be dried and preserved for food; aged the blubber in vats made of seal skin; and rendered oil from blubber in iron kettles over outdoor hearths. Oil for trade was packed in wooden kegs and large metal cans, and some for home consumption in bentwood boxes. Internal organs of the seals, including the heart, liver, stomach, and intestines, were utilized for food or as material for traditional manufactures.

Keik'uliyáa encompassed three separate subcamps along the wide gravel delta between Indian Camp Creek and Aquadulce Creek (Fig. 3). This geography is captured by the Tlingit name for the camp—Shaanáx̱ Kuwóox̱', meaning "wide valley"—and a Tlingit name for the beach between subcamps 1 and 3, which was Ayuwaakát Yasatán, meaning "gravel between two camps" (Thornton 2013). Photographs and watercolors made by members of the Harriman Alaska Expedition on June 21, 1899 depict tents and smokehouses at all three locations, which were occupied respectively by people from Yakutat, Juneau, and Sitka (Burroughs et. al 1901:161–165).

Subcamp 1 was at Indian Camp Creek, a location that is recognizable today from the creek mouth and mountain ridgelines seen in the expedition photographs (Fig. 4). This was by far the largest of the three subcamps, and its population of 200 or more indicates that it was occupied by the Yakutat contingent. Harriman photographer

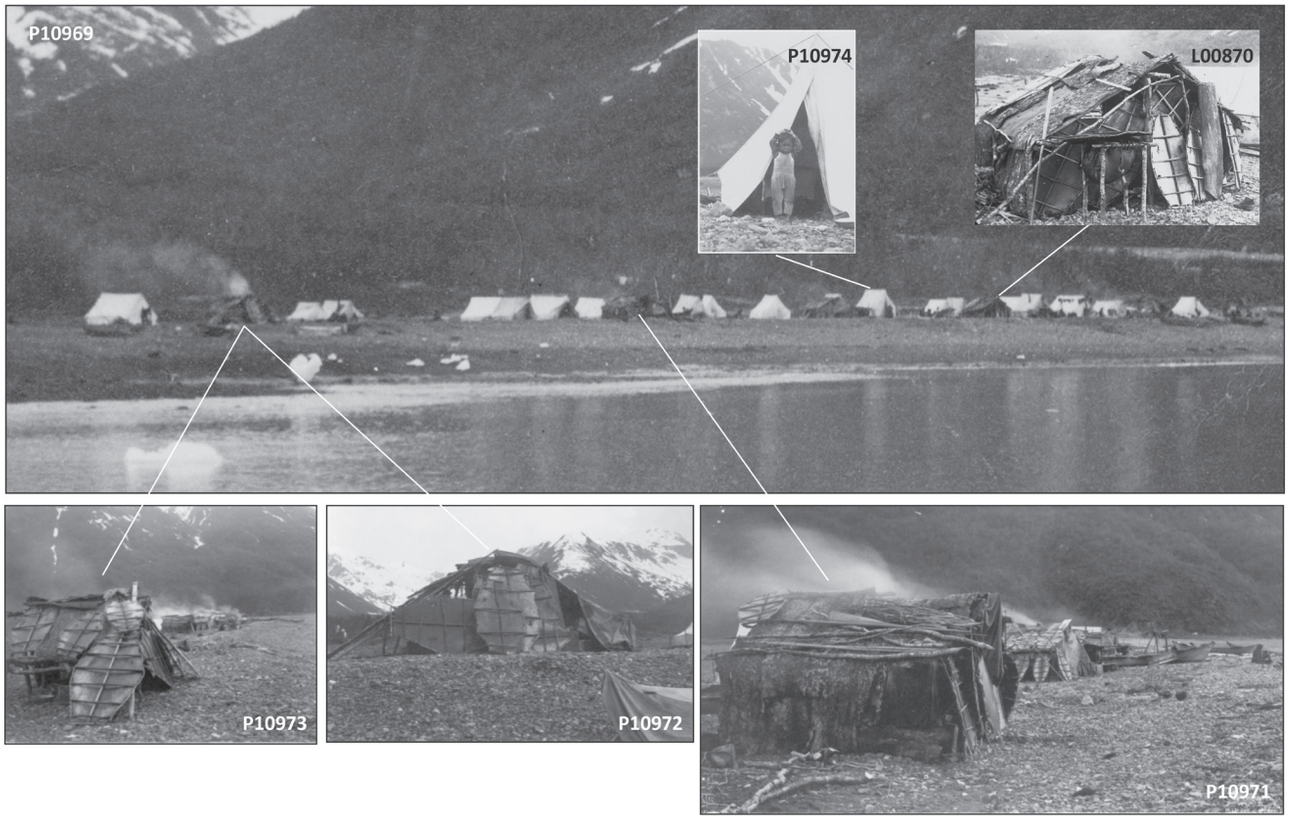

Figure 4. Composite images of Keik'uliyáa Subcamp 1 at the mouth of Indian Camp Creek, Disenchantment Bay, photographed by the Harriman Alaska Expedition on June 21, 1899. A line of bark-covered smokehouses draped with seal hides on stretchers extends along the beach in front of canvas tents. Photographs by Edward W. Curtis, courtesy of the National Museum of the American Indian (NMAI L00870, P10969, P10971, P10972, P10973, P10974).

Edward W. Curtis's images show six smokehouses along the beach east of the creek mouth, backed by a row of 18 large canvas dwelling tents. Each smokehouse may have been shared by adjacent tent households, a socio-spatial arrangement mirroring Khantaak winter village where six lineage houses and associated facilities (meat racks, canoes) were aligned along the beach.

Subcamp 2 (Fig. 5) was at the base of a cliff about 300 m east of the mouth of Aquadulce Creek and was identified in 2013 by matching the ridge, cliff, and shoreline seen in the historic images to modern terrain. Residents at this location would have been one of the visiting groups from Juneau or Sitka, although which is not known. Views from several angles show eight canvas wall tents, two smokehouses, skins on wooden stretchers, and about a dozen people, including women who are flensing blubber on boards at the top of a sloping cobble beach.

Subcamp 3 on the west side Aquadulce Creek is known only from two watercolors by Harriman Alaska Expedition artist Frederick Dellenbaugh, which show women and children near a grouping of six canvas wall tents, a bark-covered smokehouse, hunting canoes, and a meat rack (Grinnell 1995: cover image). This was the camp of visitors from either Sitka or Juneau. The cluster of structures is situated on a gravel beach berm backed by a lagoon. This feature was noted by the Harriman visitors: "Back of the beach is a lagoon of fresh water, from which the Indians get their drinking water, in which the children wade about, sailing their canoes, and in which the mothers bathe their babies" (Burroughs et al. 1901:165).

Archaeological Investigations at Keik'uliyáa

Efforts to locate the YAK-00012 archaeological site were undertaken by Sealaska Corporation in 1975 (Sealaska Corporation 1975:782–783) and by the Bureau of Indian Affairs in 1980 and 1989 pursuant to a historical place claim under section 14(h)(1) of the Alaska Native Claims Settlement Act ("Disenchantment Bay Camp," claim AA 10529). These efforts were unsuccessful, and as a result both the original claim and an appeal were denied on the

Figure 5. Composite images of Keik'uliyáa Subcamp 2 east of Aquadulce Creek, Disenchantment Bay, photographed by the Harriman Alaska Expedition on June 21, 1899. Residents of the camp are seen with smokehouses, tents, dugout canoes, and seal skins stretched on wooden frames. Women are flensing blubber from hides. Photographs by Edward W. Curtis, used courtesy of the National Museum of the American Indian (NMAI L00868, L00869, P10970. P10975).

basis of insufficient evidence. In 2011, archaeologists with the Smithsonian Institution's Yakutat Seal Camps Project discovered and tested remnants of Subcamp 1, followed in 2013 by extensive mapping and excavations. In 2013, Subcamp 2 was discovered, mapped, and tested, and other areas of the site were investigated.

Archaeological remnants of Subcamp 1 today occupy a 30 m long section of backshore beach terrace east of Indian Camp Creek (Fig. 6), an area that was uplifted 3–3.5 m during the 1899 earthquake (Tarr and Martin 1912:plate XIV). The front edge of the terrace is now about 2 m above the modern high tide limit, suggesting that 1 m or more of subsidence has occurred over the last century. Seismic uplift had the effect of shifting the occupation surface inland some 20 m relative to the modern shore, where it became thickly overgrown with alders, devil's club, ferns, and other vegetation. These changes in the nearshore terrain account for the difficulty that previous investigators experienced in recognizing the site. In addition, large areas of the camp on both sides of the remnant terrace have been destroyed by erosion. The western part was washed away by flooding from Indian Camp Creek (indicated by younger vegetation) and eastern areas were destroyed by a former stream that scoured the terrace. Flooding occurs during heavy fall rains, and streams probably regraded and cut new channels following the earthquake. Flood silts cover part of the site terrace on its west side, where they overlie cultural deposits.

It was anticipated that archaeological remains on the Subcamp 1 terrace would represent multiple seasonal occupations from as early as the 1840s (the oldest date of reported sealing at Keik'uliyáa) through the 1890s, with the most intensive usage and deposition of trade items occurring after 1870 when relations with the ACC were established. No evidence post-dating the 1899 earthquake was anticipated because active habitation would have shifted to the new shoreline, leaving behind the old terrace camp. However, searches of the modern

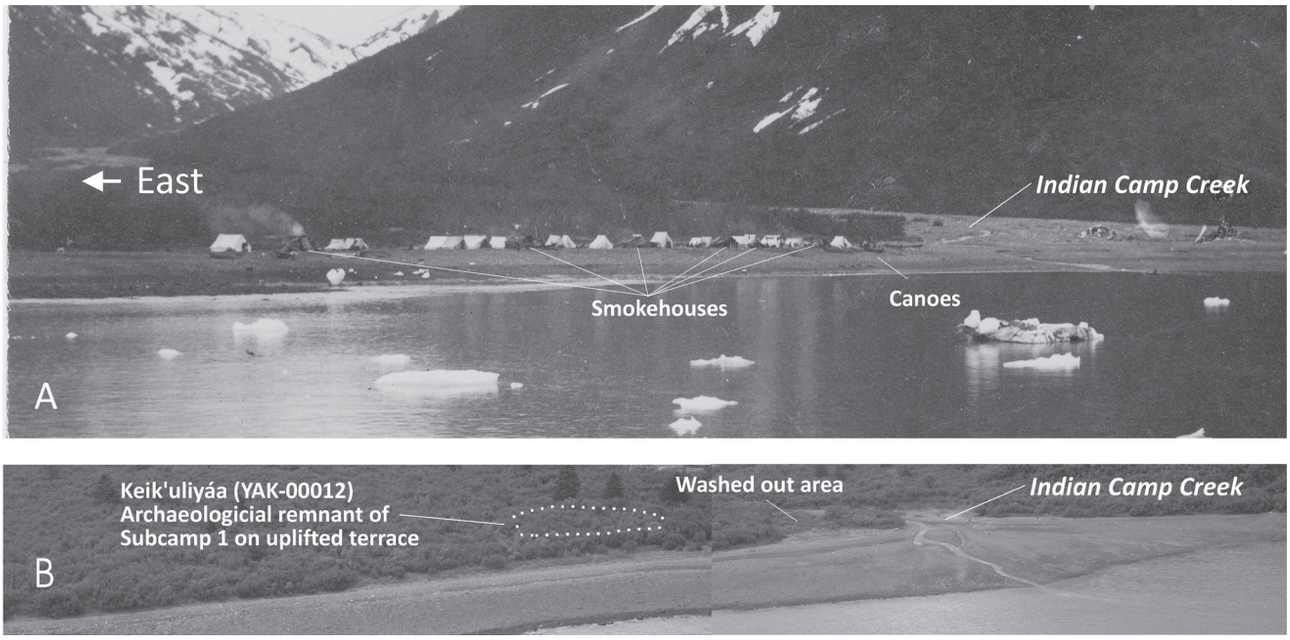

Figure 6. Keik'uliyáa Subcamp 1 in June 1899 (above) and the location of archaeological remains of the central portion of the camp (below). Photographs courtesy of the National Museum of the American Indian (NMAI P10969) and Alaska ShoreZone Coastal Mapping and Imagery (https://alaskafisheries.noaa.gov/shorezone/, images se05_ml_4863 and se05_ml_4864).

beach from the lower intertidal zone to the base of the terrace did not produce any evidence of post-1899 occupation, perhaps because of storm erosion and ongoing subsidence.

Clearance of vegetation and leaf litter from the terrace led to the discovery of several patterned rock features. The terrace substrate consists of sand, gravel, and small cobbles, thus larger beach cobbles found on its surface can be identified as manuports brought up from the intertidal zone by the camp's occupants. The bases of these large cobbles rest on top of the old beach stratum rather than emerging from it. The Harriman photographs give evidence that rocks of this size (20–40 cm across) were used to hold down tent walls, anchor guy lines, brace the bottoms of framing poles for smokehouses and meat racks, and construct hearths. Seven rock groups and outlines between 4 m and 8 m long were defined (Fig. 7). At least two of the outlines (structures 1 and 2) appear to be the footprints of canvas wall tents, with alignments of large exterior rocks for tying guy lines and smaller interior rocks for holding down the bottom edges of the walls, particularly on the predominant upwind (northwest) side. Structures 3 and 6 are large, single row outlines that may mark the locations of extended or double tents (one of which can be seen in the Harriman photographs). The apparent correspondence of structures 1, 2, and 3 with tents photographed in 1899 along the central part of the beach is shown in Figure 8.

Other rock groupings are less clear and may represent older structures from which rocks were scavenged for reuse. Structure 7 is a partial outline that has been cut off by erosion along the edge of the terrace. Feature 1 is an exterior cooking or blubber-rendering hearth, filled with charcoal and surrounded by metal can fragments and lenses of oil-saturated sand. No interior hearths were found during excavations of structures 1, 2, or 3, which is consistent with their interpretation as tents since smokehouses would contain concentrations of charcoal from fires. Photographs show that some tents had metal chimneys, indicating that the interiors were heated with small iron stoves.

A total of 62 m^2 was excavated at Subcamp 1 during 2011 and 2013, including structures 1, 2, and part of 3; Feature 1; and several midden test units. The sandy cultural deposits are nowhere more than 8–10 cm thick and underlie 5–10 cm of modern humus and (around Structure 3) up to 15 cm of gray silt deposited by flooding. Shovel tests indicate that cultural midden covers an area of about 1,200 m^2 (30 m by 40 m), so that excavations affected approximately 5% of the total extent. Bone preservation is very poor in the sandy, acidic soil and only seven small, unidentifiable fragments were found. The only other known faunal remains that survive from the camp are three harbor seal skulls (two juveniles and an adult) collected by the Harriman expedition in 1899 and

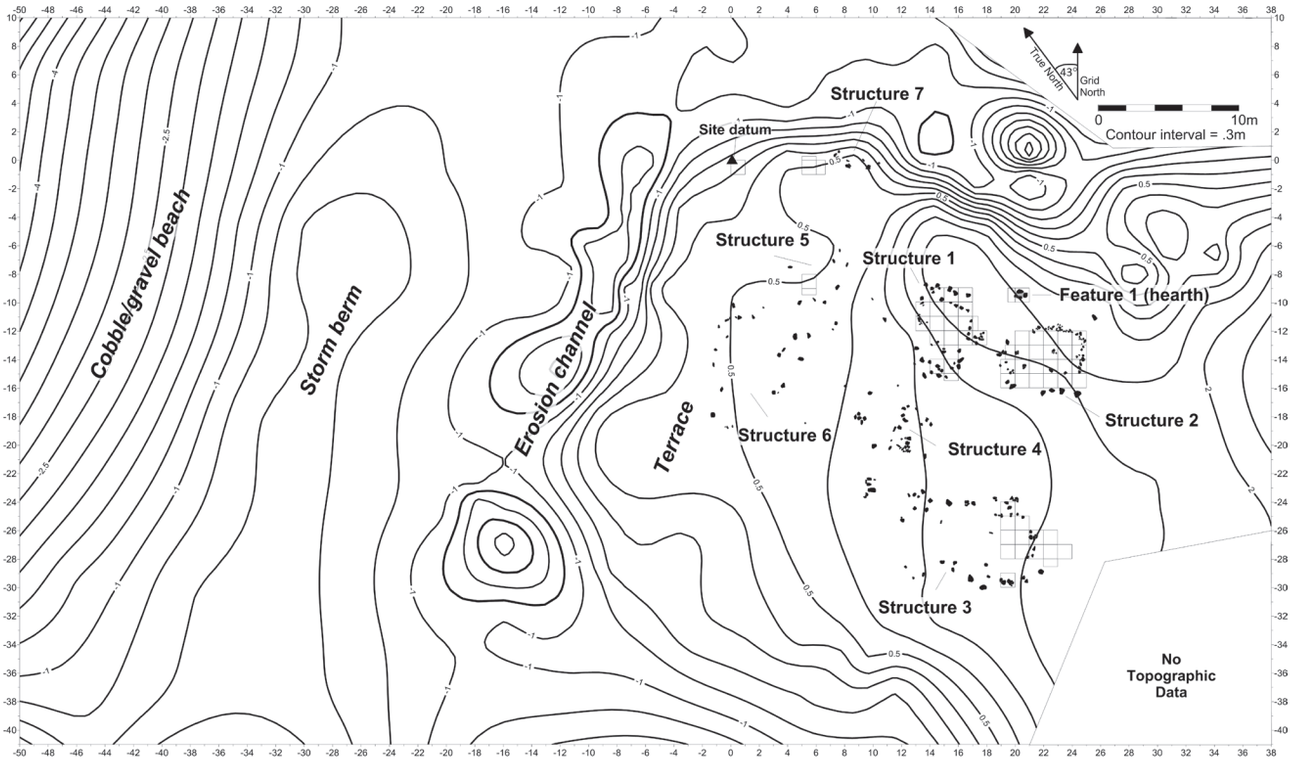

Figure 7. YAK00012 Subcamp 1 site map showing uplift terrace surrounded by erosion channels, cultural features including tent outlines, and the 2011–2013 excavation grids.

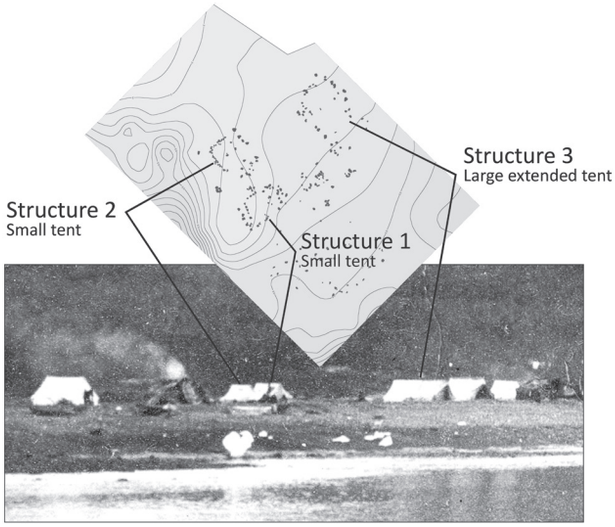

Figure 8. YAK00012 Subcamp 1 showing apparent alignment between excavated archaeological structures and tents photographed in 1899 by the Harriman Alaska Expedition. The tent grouping is in the central part of the 1899 encampment. Photograph courtesy of the National Museum of the American Indian (NMAI P10969 detail).

cataloged in the Mammals division of the National Museum of Natural History.

Over 1,200 artifacts were recovered from the excavations in 2011 and 2013 (Table 1). Firearms-related items include center-fire cartridges that are consistent with the breech-loading carbines and rifles that the sealers were using in 1899 (Fig. 9). These were a .32-40 Winchester cartridge first manufactured in 1886 (Barnes 2012:125–126); a Winchester .25-20 W.C.F. cartridge made for the Winchester Model 1892 rifle (Barnes 2012:113); and a Union Metallic Cartridge (U.M.C.) .44 of unknown date for the Winchester 1873 rifle. A brass Winchester shotgun shell for guns made between 1887 and 1897 was also found. Ammunition for breech-loading shotguns listed in 1874 among ACC purchases for Nuchek station (ACC 1869–1905). A post-1930 Remington .22 Hornet casing (Barnes 2012:17) and a .30-06 Springfield military cartridge first made in 1906 (Barnes 2012:383) were the only artifacts definitively more recent than the earthquake and suggest that some later use may have been made of the terrace. Lead bullets, drips, and scrap along with dozens of spent center-fire primers indicate that the hunters were reloading their cartridges at the camp. Several lead balls apparently from older muzzle-loading weapons were also found, but no percussion caps or rim-fire cartridges.

Table 1. Artifacts from Keik'uliyáa site (YAK-00012)

Artifact	YAK-00012 SUBCAMP 1	YAK-00012 SUBCAMP 2
Firearms		
Rifle cartridge	6	1
Shotgun cartridge	1	—
Cartridge primer (expended)	39	1
Lead fragments/stock/drips	18	—
Lead bullets and shot	4	—
Gun barrel section	—	1
Metal Household		
Iron nail	51	4
Iron rivet	14	—
Barrel strap	1	—
Iron fragments and miscellaneous	116	14
Stove door	—	1
Iron tube	2	—
Iron can fragments	8	1
Iron ring or handle	2	1
Iron spoon	2	—
Brass grommet	10	—
Brass disk	1	—
Copper tea kettle	1	—
Copper foil, strip, or fragment	3	—
Cigar tube end	—	1
Ceramic & Glass Container		
Glass bottle or fragment	1	1
Ceramic vessel fragments	15	1
Clothing/Ornament		
Glass seed bead	937	4
Wool or cotton cloth fragments	8	4
Leather fragments	3	—
Button	1	—
Pin/brooch	1	—
Belt buckle (iron)	2	—
Clasp	1	—
Rubber comb	—	1
Toys		
Clay marble	2	—
Ceramic doll fragment	2	—
Lithic		
Quartz crystal	2	—
Hammer stone	1	—
Stone awl	1	—
Totals	**1256**	**36**

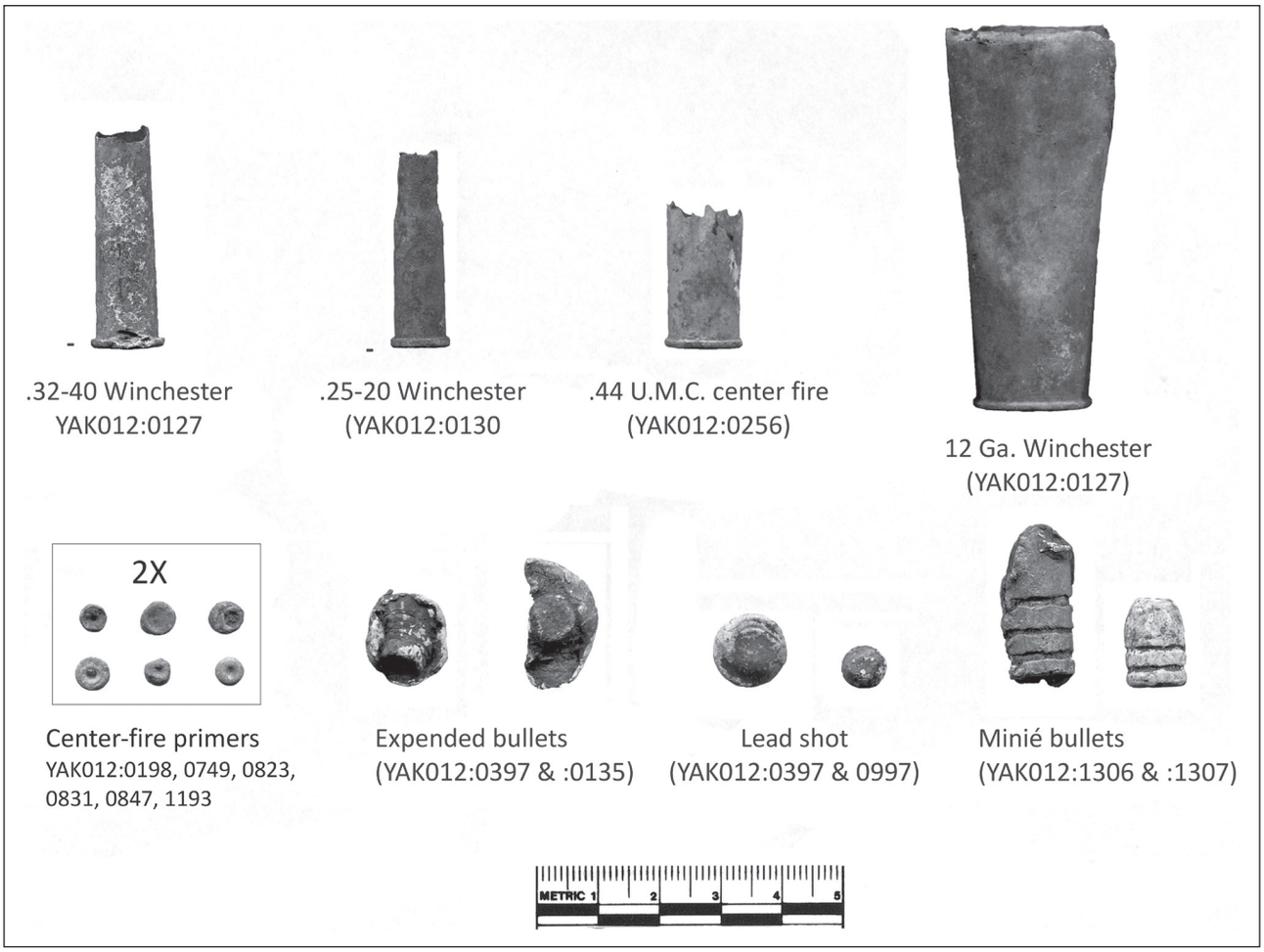

Figure 9. Firearms-related artifacts from Keik'uliyáa Subcamp 1 (brass rifle and shotgun cartridges, expended center-fire primers, lead bullets and shot) and Minié balls from terrace between subcamps 1 and 3.

Other metal artifacts (Fig. 10) included grommets, rivets for fastening leather, wire nails, can fragments, an iron spoon, a belt buckle, iron rings and handles, iron and copper fragments, and a tea kettle. Additional artifacts included wool and cotton fabrics; pieces of shoe leather; rubberized cloth from tarps or boots, one embossed with an 1872 manufacturing stamp; a four-hole button; fragments of porcelain and Willoware ceramics; two clay marbles; and parts of two porcelain dolls, probably German made (Fig. 11). The most abundant artifacts were hundreds of tiny glass seed beads in more than 20 colors, which are a late 19th-century type in Alaska (Crowell 1997). Most were found clustered inside structures 1 and 2 near the tent entrances where light would have been better for beadwork. Two quartz crystals, interpreted as spiritual objects (possible hunting charms) by Tlingit elders, were found in Structure 1. The assemblage reflects access to Western goods acquired from the ACC post at Nuchek and other trading posts. Closely comparable collections of artifacts have been found in the Glacier Bay region near Hoonah at sites including the Homeshore Lineage site, occupied from the 1870s to early 1900s (Ackerman 1965:10–36); House 1 at the Grouse Fort site, dating to the 1890s (Ackerman 1968:14–53); and the historic component at Xákwnoowú, about 1885 to 1900 (Crowell et al. 2013).

Archaeological remains of Subcamp 2 (Fig. 12) occupy a bench at the base of a cliff and extend down the upper beach slope, with a total site area of about 40 m by 15 m (600 m^2). The bench elevation is 9 m above present day high tide, in an area where uplift in 1899 was estimated to have been close to 3 m (Tarr and Martin 1912: Pl. XIV). From the bench down to the top of the modern beach, a distance of 60 m, a surface that was bare and rocky in 1899 is now overgrown with large alders and berry bushes. As at Subcamp 1, rocks that are larger than the

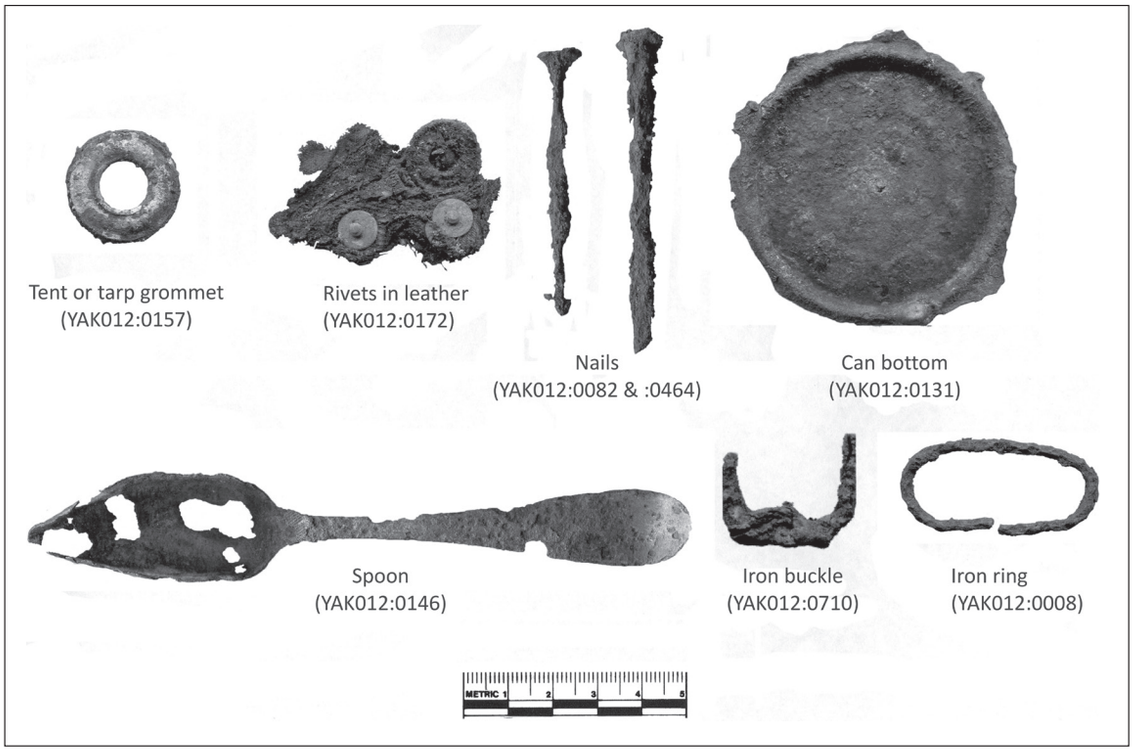

Figure 10. Metal artifacts from Keik'uliyáa Subcamp 1: grommet, rivets in leather, nails, can base, spoon, iron buckle, and iron ring or handle.

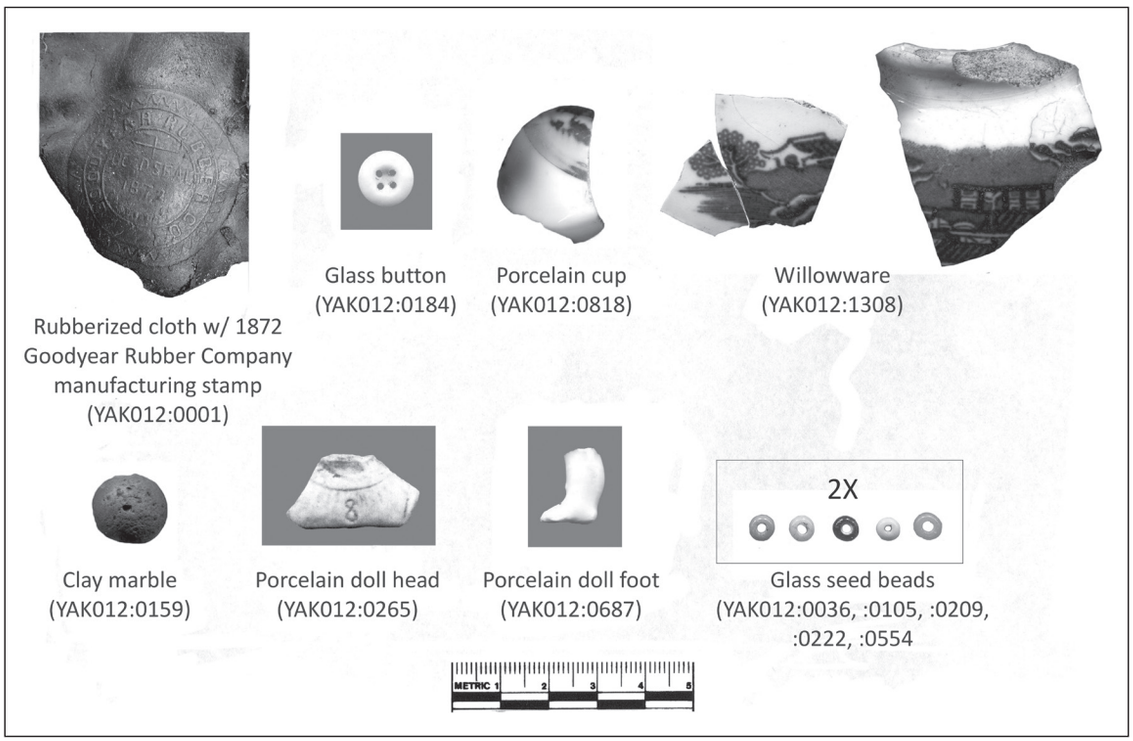

Figure 11. Artifacts from Keik'uliyáa Subcamp 1: rubberized cloth with 1872 manufacturing stamp, glass four-hole button, porcelain cup fragment, Willoware plate fragments, clay marble, porcelain doll's head (neck and collar), porcelain doll foot, glass seed beads.

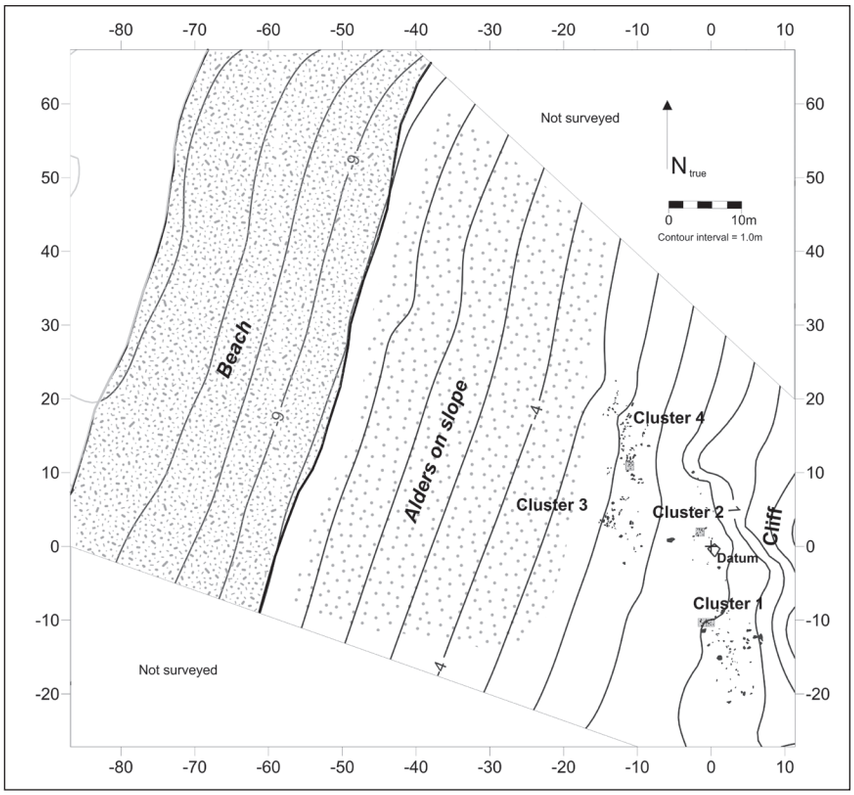

Figure 12. YAK-00012 Subcamp 2 archaeological site showing cultural rock clusters at the base of a cliff east of Aquadulce Creek.

gravel/pebble substrate occur in distinct clusters on the site surface, but here they do not form obvious structural outlines with the possible exception of Cluster 4. Most of these rocks are flat, angular slabs rather than the rounded beach cobbles used for camp construction at Subcamp 1, and some may be noncultural colluvium that has fallen from the cliff face.

After an initial metal detector scan of the site, four 1 m by 1 m test units were excavated in rock clusters 1, 2, and 4 to test stratigraphy and obtain a sample of diagnostic artifacts. As at Subcamp 1, the cultural level was very thin, consisting of a brown sand and pebble matrix (4–10 cm thick) with occasional charcoal, lying beneath a few cm of leaf litter and humus. A total of 35 artifacts from the test units included the following: a .22 caliber extra-long rim-fire cartridge with a "U" (Union Metallic Company) head stamp; an expended center-fire primer; a sawn-off section of gun barrel, possibly used as a pipe bowl; the door of a small iron stove; an aluminum cigar tube stamped with a Philadelphia patent date of 1886; an ornate blown-glass perfume bottle (net yet identified or dated); part of a rubber comb; two seed beads; pieces of woven fabric; wire nails; and iron fragments (Fig. 13). No bone or shell pieces were found. The assemblage is consistent with occupation during the 1870s to 1890s.

No archaeological remains of Subcamp 3 have been discovered, despite searches in 2011 and 2013. Today the west side of Aquadulce Creek where it enters the bay is bordered by a bank of glacial till about 4 m high, which is being actively eroded by stream cutting. The top and sides of the cutbank and the gravel flats at its base were examined without any cultural findings. The present-day storm berm at the mouth of the creek is backed by a similar small brackish pond as in 1899, but given the geomorphic dynamism of the beach and stream it is not possible to know if the location is the same.

Surface surveys and metal detector scanning were conducted along the raised beach terrace that extends between Indian Camp Creek and Aquadulce Creek. Midway between subcamps 1 and 3, adjacent to a dry stream channel and near the edge of the cutbank (see Fig. 3), two Minié bullets ("Minnie balls") were discovered with the metal detector. The larger (of rifle caliber) was deformed by impact but the smaller (possibly from a pistol) was not fired. These projectiles are for mid-19th-century rifled muskets or muzzle-loading pistols and were first developed in the

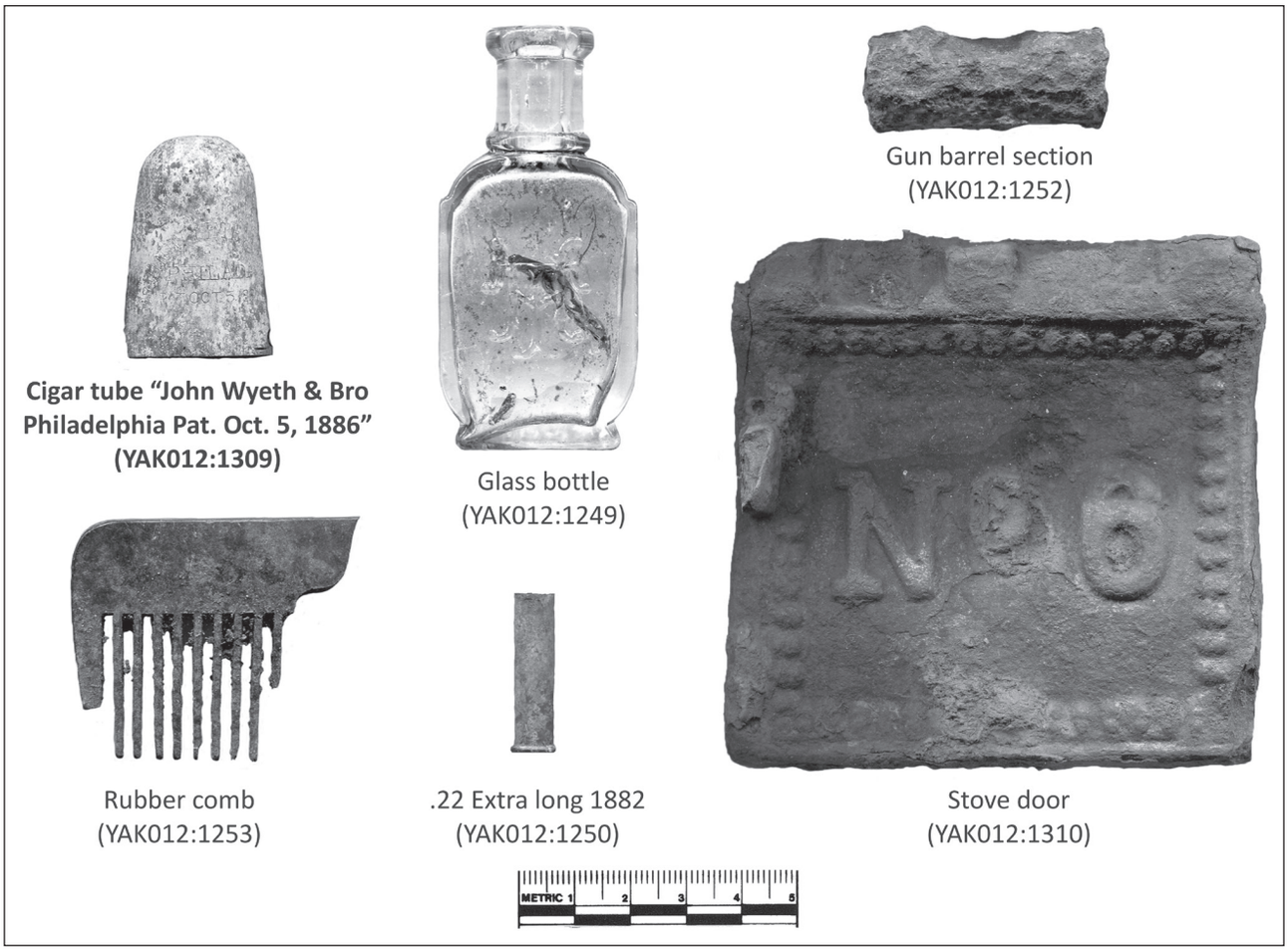

Figure 13. Artifacts from Keik'uliyáa Subcamp 2: cigar tube, glass perfume bottle, section of gun barrel, rubber comb, .22 rifle cartridge, door from small iron stove.

1840s and used extensively during the U.S. Civil War. The Minié bullets may be the oldest cultural evidence found at YAK-00012 and are chronologically consistent with use of the area for seal hunting as early as the 1840s.

To summarize the archaeological data, Keik'uliyáa (YAK-00012) is a multicomponent site with abundant material evidence that augments oral, historical, and photographic information about late 19th-century sealing. Artifacts found at subcamps 1 and 2 are consistent with occupation during the 1870s through 1890s, and Minié bullets from the intervening shoreline are several decades older. Subcamp 2 and the terrace at Subcamp 1 appear to have been abandoned after the 1899 sealing season and the earthquake that followed in September of that year, and the spatial arrangement of dwellings and activities corresponds closely to visual documentation from the Harriman expedition.

While faunal remains that would help to document the hunting pattern at Keik'uliyáa have not been preserved, artifacts from the site illustrate production and consumption in the new market economy. At least two technological generations of firearms are in evidence, the older represented by lead balls from muzzle-loading guns, which presumably had percussion-cap firing mechanisms like the double-barreled rifle-shotgun weapons reported by Abercrombie in the mid-1880s. Expended percussion caps from such guns are surprisingly absent but may have been discarded on the hunting grounds rather than in camp. No flints or parts of older flintlock guns were found. The newest firearms were breech-loading rifles and shotguns, apparently adopted at Keik'uliyáa by the late 1880s or early 1890s. Brass cartridges from these weapons were being reloaded in camp, as shown by expended primers and lead scraps from bullet making. The relatively small number of discarded cartridges further indicates that this type of ammunition was being curated and reused to save costs, a practice that Yakutat seal hunters continue to the present day. It is notable that modern sealers prefer rifles of smaller caliber (.22 or .223)

than generally used in the 19th century because they are far quieter and less likely to spook the seal herd.

Diverse categories of other consumer goods were used at the site, from canvas tents to stoves, cookware, dinnerware, clothing, beads, shoes, toys, and personal items. Locally made objects are archaeologically nearly absent, although we know that many were in fact being used including wooden dugout canoes, bentwood boxes for storage of food and oil storage, and harpoons for securing seals. The general replacement of traditional skin, fur, and gut clothing by store-bought hats, scarves, cotton shirts, pants, and dresses can be seen in the Harriman photographs and is reflected in archaeological findings of cloth, rubber, shoe soles, and a button. Overall, it is clear that imported goods—received in exchange for both seal products and furs—had come into everyday use for the Yakutat population and for Tlingit visitors from other communities, even when residing in camps that were distant from their permanent homes. Conversely, the scarcity of food-packaging artifacts (e.g., metal cans, glass bottles) suggests that most of the camp diet was locally obtained, and indeed Burroughs said that the "only food" there was seal meat and cow parsnip (wild celery) (Burroughs et al. 1901:59). The large number of glass beads found at Keik'uliyáa suggest that women's crafting of beaded sealskin moccasins and bags for sale was another form of market production that was carried out in camp and added to household incomes.

Discussion: Intensification and Sustainability

The people of Yakutat accomplished market production of seal products through the *intensification* of preexisting economic and social patterns. Production of surplus skins and oil required the multifold increase of an already important subsistence harvest, made possible by firearms that enhanced hunting efficiency. Balls or bullets could strike with accuracy and lethal effect from a much greater distance than a hand-thrown harpoon, reducing the time, effort, and failure rate involved in closely approaching wary seals by canoe through the ice floes. With breech-loading, magazine-fed rifles like the Winchester repeating rifle or repeating carbine (Gluckman 1959), the rate of fire was also greatly increased over both harpoons and muzzle-loading guns so that multiple animals could be hit in rapid sequence. A negative trade-off was that the noise of gunshots could frighten away animals not anchored by dependent pups and for this reason (and also to take prenatal pups still in their white lunago pelage) the Kwaashk'i K̲wáan clan leader sometimes ordered harpoon-only hunting before the beginning of the regular season (de Laguna 1972:374). Another disadvantage of guns was the sinking and loss of wounded animals that could not be secured in time with a follow-up harpoon strike or boathook, also a factor in modern sealing where the reported loss rate of shot animals was about 6% at Yakutat in 2007 and higher in other communities (Wolfe et al. 2008).

The seasonal movement of the entire Yakutat community to Disenchantment Bay for a two-month period of nearly exclusive sealing was another aspect of intensified production, although also rooted in older patterns. Centuries earlier when the rookery could be reached easily from Knight Island there were probably no sealing camps, and hunting was conducted from the main village of Tlakw.aan. As the ice withdrew into Disenchantment Bay sealing camps were established there but probably used by fewer people or for a shorter period of time than in the late 19th century, to fulfill subsistence needs only. It appears that only during the commercial era did the community commit so completely to sealing as a major component of its annual round.

Like subsistence hunting, the commercial hunt for seals was organized on the basis of matrilineal clan structure and ownership rights. The Kwaashk'i K̲wáan Raven clan owned the land in Disenchantment Bay and the seal resources at the glacier by right of descent, going back to their purchase of these rights from the Eyak some four centuries earlier. The Kwaashk'i K̲wáan leader controlled the timing and organization of the hunt; formally invited other Yakutat clans, both Eagle and Raven, to participate (all clans being linked by reciprocal relations); and gave permission to more distantly related groups from Juneau, Sitka, and other locations to join the enterprise, although the latter were expected to occupy different sections of Keik'uliyáa sealing camp or to stay elsewhere around Disenchantment Bay (George Ramos, 2011 interview).

The socio-spatial organization of Subcamp 1 at Keik'uliyáa, with its six smokehouses and 18 associated residential tents, appears to mirror the alignment of matrilineage houses at the Yakutat winter village on Khantaak Island (Shark House, Brown Bear House, Drum House, Moon House, Fort House, Wolf Den House), suggesting that the same cooperative, extended households worked together for sealing production. The division of labor between men and women in the hunting and processing of seals, respectively, was another expression of clan cooperation and reciprocity, since the lineages are exogamous and husbands and wives would normally have belonged to "opposite" moieties (Raven or Eagle). Commodities flowing into the community as the result of

cooperative labor and trade in the sealing industry were redistributed by clan leaders through social mechanisms including the memorial potlatch, which came to include large quantities of blankets, guns, and Western manufactures of all kinds (de Laguna 1972).

The 19th-century hunt appears to have been managed for maximum yield based on indigenous knowledge of seal behavior, available hunting technology, available labor, and market demand, unrestricted by conservation measures designed to limit hunting and preserve the seal population. In particular, the traditional prohibition against hunting at the rookery before pups were born was a strategy to increase the take, rather than reduce it, and the absence of any cultural check to the killing of very large numbers of seals is illustrated by Yakutat hunters' participation in the subsequent bounty and commercial hunting periods of the 20th century. This is not to say that the seals, and the glacier that is thought to provide and protect them, were not spiritually honored and thanked with prayer, as they were; some maintain these traditional practices today (Elaine Abraham and George Ramos, 2011 interviews).

It is possible, however, that there was no reason or need for indigenous conservation measures because the 19th-century harvest level was sustainable, given the abundance of the species and its reproductive capacity. On a regional scale, the National Marine Fisheries Service (NMFS) estimates that the harbor seal population in the Gulf of Alaska is currently about 150,000 animals (Allen and Angliss 2011:33–34), and this may be less than half of what it was prior to intensive commercial hunting in the 1960s and the ecosystem-driven decline that started in the mid-1970s (Kruse and Springer 2007). If we conservatively posit a late 19th-century Gulf of Alaska population of at least 300,000, an annual take at Disenchantment Bay of 3,000 animals would have been only 1% per year of the regional total, whereas NMFS calculates that the sustainable harvest level (called "potential biological removal") for harbor seals is about 3% per year (Allen and Angliss 2011:33–34). While this suggests that intensive sealing at Yakutat in the 1870s through 1890s might not have had a significant impact on regional seal numbers, the local effects are unknown and could have been far greater due to the concentration of hunting in a limited area. The NMFS guideline for sustainable yield, if applied to the present Disenchantment Bay rookery population of 2,100 seals, would allow only about 60 to be taken per year, which is about the actual number currently killed there rather than elsewhere in Yakutat Bay (Jeremiah James, interview 2014). If applied retroactively to the 19th century, a sustainable yield of 3,000 seals per year would have required a rookery population of about 100,000 seals, almost fifty times the current number. Whether the Disenchantment Bay harbor seal population was ever that high is not known.

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The archaeological team that conducted research in 2013 at Keik'uliyáa camp included principal investigator Aron Crowell; archaeologists Mark Luttrell and Matt O'Leary; volunteer Tim Johnson; and University of Alaska Anchorage (UAA) field school students Tamara Holman, Katherine House, Patricia Wright, Emily Rose Bryson, Emily Silber, Sarah Jones, Fawn Abt, Meghan Caves, Sarah Wilson, and Emma Bailey. Zooarchaeologist Michael Etnier (Portland State University) identified faunal remains from Yakutat sites. UAA graduate student Carmen Lorena Medina-Dirksen researched and imaged Alaska Commercial Company records for the company's Nuchek and Yakutat stations, which are archived at the Rasmuson Library, University of Alaska Fairbanks. Funding was generously provided by the National Science Foundation through Arctic Social Sciences Program EAGER grant 1132295 in 2011 and Research Grant 1203417 in 2012–2014, with the advice and support of Anna Kerttula, NSF-ASSP Program Director. The views and conclusions expressed in this paper are the author's and do not necessarily represent those of the National Science Foundation. CH2MHill Polar Services provided field support and logistics, with special thanks to Christie Haupert, Matt Irinaga, and Ken Jessen.

This paper is dedicated to great friend and colleague Douglas Veltre in honor of his inestimable contributions to Alaskan historical archaeology.

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